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Health Hazards in the Dry Cleaning Industry

By J. P. Russell, M.D., *Chief,* Industrial Hygiene Service, California State Department of Public Health

A study of processes, industrial health and welfare provisions, potential occupational health hazards, and control measures provided for the health protection of workers in San Francisco dry cleaning establishments has been made by the Industrial Hygiene Service of the State Department of Public Health, in cooperation with the State Department of Industrial Relations. In a report submitted to Dr. W. M. Dickie, State Director of Public Health, by Dr. J. P. Russell, Chief of the Industrial Hygiene Service, the results of this study are summarized as follows:

All of the 51 dry cleaning plants in the city, employing a total of 637 workers, were included. Thirty-one per cent of these plants, with 7 per cent of the workers, have four employees or less; 49 per cent of all workers in the industry, in 61 per cent of the plants, are employed in establishments with 5 to 25 employees; 8 per cent of the plants, with 45 per cent of the workers, employ over 25 persons.

None of the plants has either a full-time or part-time safety director. Ten per cent of the plants, employing about one-third of the workers, have safety committees. Almost all of the plants and workers receive some type of safety service from insurance companies.

The services of a physician are available to all plants on short notice, but none of the plants has a hospital or first-aid room on the premises. One plant has a service contract with an outside hospital. Most of the plants, employing 94 per cent of the workers, have first-aid kits, but only six plants, with 44 per cent of all employees, have workers who are trained in the proper use of the contents of these kits, or in other first-aid measures. The services of a trained nurse are available to the workers in two plants, one on full-time and the other on a part-time basis. None of the employees are given physical examinations either prior to or during employment.

Seven per cent of all workers, employed in two of the plants, belong to sick benefit organizations. One plant keeps records of nonoccupational sicknesses. All plants carry compensation insurance covering occupational diseases among their employees. Forty-eight of the 51 plants keep accident records.

Pressers, markers, spotters, and dry cleaners comprise about 79 per cent of all employees in the industry.

The materials and environmental conditions to which dry cleaning plant employees are exposed to some degree in the course of their work, and which may have a detrimental effect on their health unless they are adequately controlled, include temperature changes (56 per cent of all employees); alkalies (30 per cent); gases (28 per cent); organic solvents (26 per cent); inorganic salts (25 per cent); organic acids (25 per cent); infections from handling soiled clothes (23 per cent); alcohols (23 per cent); and halogenated hydrocarbons (22 per cent). Other potentially harmful materials to which less than 20 per cent of the employees are exposed include fluorides, mineral acids, excessive dampness, carbon monoxide, chemicals, coal tar products; organic, silica, silicate, nonsiliceous, and metallic dusts; cyanides, and dyes.

These material exposures represent potential, but not necessarily actual, health hazards. Ventilation, enclosed processes, personal respiratory devices, and protective clothing are provided in many plants and give some degree of protection for many of these exposures. The degree of hazard due to exposure to these materials, and the effectiveness of the control measures, can be determined only by quantitative studies.

Chlorinated hydrocarbons such as carbon tetrachloride and tetrachlorethylene are used as cleaning solvents in 35 of the 51 plants studied. The vapors of these solvents are poisonous when inhaled in high concentrations or for prolonged periods of time. Roughly quantitative determinations of the amount of halogenated hydrocarbon solvent vapor in the air at the breathing level of operators of dry cleaning units were made in 13 selected plants, in which various makes of equipment are used. Little or no solvent vapor was found in the air breathed by the operator of a completely enclosed system, but concentrations greatly exceeding the safe limit were found to be present during certain stages of the cleaning cycle in most of the semienclosed and unenclosed systems.

Based on the information obtained in this survey, interviews with employers and employees, and personal observations of working conditions, the following measures were suggested for the protection of health and the improvement of efficiency of dry cleaning plant employees. Many of these provisions are already in effect in a number of plants.

1. Chlorinated hydrocarbon solvents should be used only in a completely closed system, in which the clothing is not handled by the operator from the time it is put into the washer until after it is dried. All parts of the system, including cleaning drum, connecting pipe, still, and filter, should be enclosed in a cabinet or small room, equipped with exhaust ventilation. It should not be necessary for the operator to enter this cabinet at any time during the cleaning and drying cycle.

2. In plants using petroleum solvents, local exhaust ventilation should be provided to collect the vapors near the floor level, so that they may be held below the breathing zone and removed without causing undue exposure. This type of ventilation is needed for both petroleum and hydrocarbon solvents, particularly at the filter and still, where an excessive exposure to vapors may occur during cleaning of these units.

3. Exhaust duct outlets should extend sufficiently high to clear the roof, in order to prevent the discharged vapors from re-entering the workroom through open windows or doors.

4. Ventilating facilities in a workroom in which dry cleaning equipment is located should be of sufficient capacity to insure a complete change of air in the room every five minutes.

5. Employees who clean filters and stills should be provided with airline respirators, self-contained oxygen breathing apparatus, or approved gas masks of the cannister type. Chemical cartridge respirators are of insufficient capacity to provide adequate protection against the inhalation of organic solvent and halogenated hydrocarbon vapors except in low concentrations and for short periods of time. Therefore they should not be relied upon for protection in this type of work.

6. Lateral local exhaust ventilation should be provided for the removal of toxic gases and vapors from the spotting tables.

7. All employees who work with or near toxic solvents, or who are exposed to their fumes or vapors, should be informed by the employer of the hazards involved. Printed instructions for safe operating methods should be posted conspicuously in the workroom.

8. Persons who use alcoholic beverages in excessive quantities, or who have chronic liver or kidney disease, should not be employed where solvents capable of producing fumes, gases, or vapors injurious to health, are used.

9. Frequent physical examinations, and rotation of workmen in hazardous occupations are recommended.

10. Each plant, regardless of size, should have one employee, designated as safety director, who is responsible for the enforcement of safety rules; the maintenance in good working order of safeguards and protective devices for the prevention of accidents and the control of health hazards; and the education of employees in the strict compliance with safety orders, and the invariable use of protective measures.

11. Employees should be urged to cooperate, through safety committees, with the employer in initiating and maintaining safe working conditions.

Owners and managers of the plants included in this survey are taking an active interest in the health protection of their employees. However, most of these establishments employ fewer than 25 workers, and in most small plants it is economically unfeasible for the management to conduct an adequate industrial health program without outside assistance. The personnel, equipment, and laboratory facilities of the State Department of Public Health are available without cost to all California industries for assistance in the study, evaluation, and practical control of their occupational health hazards.

RESULTS OF N. Y. A. SYPHILIS SURVEY

Serological tests for syphilis have been made upon applicants for N. Y. A. work relief in California and persons already employed on such projects. The only youths required to take the test were those employed on residence projects. The California State Department of Public Health, through a cooperative arrangement with the National Youth Administration, assisted by clinics operated by local health departments, conducted the survey.

Out of a total number of serlogical tests performed on 1094 young men and women in 1939, just 12 or 1.09 per cent of the total were definitely positive, and 8 gave doubtful positive reactions. Of the 12 positive reactors, only 3 stated that they had previous knowledge of infection. It is apparent then that 9 wholly unsuspected cases of syphilis were revealed in the survey. The age of the individuals tested ranged from 16 to 24 years. No records of sex or race were maintained. The majority of the individuals tested were high school and college students.

It would, therefore, not be out of place to compare the results of the N. Y. A. survey in 1939 with the surveys made in more than 500 colleges and reported by the U. S. Public Health Service in the Journal of Social Hygiene for April, 1939, Volume 25, Number 4, pages 184 to 192. In these surveys, out of 78,388 white college students who were tested, 0.199 per cent gave positive syphilis reactions in serological tests, and of 2313 negro college students tested, 2.68 per cent gave positive results. It must be remembered, however, that the exact number of high school and college students who were tested in the California N. Y. A. surveys is unknown.

PREMARITAL AND PRENATAL TESTS

From September 19th to December 31, 1939, out of 23,684 premarital tests made in California, 404 were found positive or 1.71 per cent. During the same period, out of 29,529 prenatal tests, 490 or 1.66 per cent were found positive. Of the premarital tests, more than 56 per cent were done in private laboratories, 32 per cent in public health laboratories and 12 per cent in the state laboratory. Of the prenatal tests, 58 per cent were performed in private laboratories, 26 per cent in public health laboratories and 16 per cent in the state laboratory.

DRUG DISTRIBUTION

During December, drugs sufficient for 19,424 treatments of syphilis cases were distributed to private physicians, health officers and clinics.

DOG FOODS ARE SURVEYED

Due to the recent discovery of metal and foreign substances in dog foods, an intensive investigation was instituted to determine the actual reason for the presence of such materials in this product. As a result, all tallow works, milling companies, dog food canneries and slaughter houses were inspected. The meat by-products, offal, etc., were examined for pins, meat hooks, pieces of wire, lead bullets, etc. All machinery was investigated to determine the type and size of electro-magnets and screens which should be used to extract metal from raw materials. In several instances dog food canneries were checked and products sampled. The samples were opened, reduced to soupy consistency and were run over electro-magnets.

FOOD DAMAGED BY FIRE

Several disastrous fires occurred during November and December in canneries and storage warehouses. As a result of a fire in a packing plant, more than 16,000 cases of canned fruits and vegetables were damaged. It was necessary to destroy more than 3600 cases of such products. Fire in another cannery necessitated the reconditioning of the entire stock under supervision of an inspector of the Bureau of Food and Drug Inspection. A warehouse fire damaged 20,000 sacks of beans, a portion of which was damaged to such an extent that it was necessary to divert it to hog feed. A lot of prunes totaling 2,000,000 pounds was damaged by fire, water and smoke and the entire lot was quarantined pending segregation and sampling.

SEROLOGICAL SURVEY IN LABOR UNIONS

Arrangements were made during December for carrying on a serological program among labor union members of Contra Costa County. A total of 25,000 bulletins pertaining to venereal diseases was distributed by the Bureau of Venereal Diseases among union labor men in the East Bay counties, and it is anticipated that the serological program will be completed during January. Out of 800 union members tested during December, 3.1 per cent have been found syphilitic. Union labor officials have requested that the serological program be repeated annually for several years.

CASE REPORTS OF VENEREAL DISEASES

In December of 1939, 1380 cases of gonorrhea and 1604 cases of syphilis were reported throughout the state.

MORBIDITY

Complete Reports for Following Diseases for Week Ending January 27, 1940

Chickenpox

577 cases: Alameda County 6, Alameda 5, Berkeley 14, Oakland 33, Butte County 1, Colusa County 1, Contra Costa County 1, El Cerrito 1, Pittsburg 3, Fresno County 5, Coalinga 1, Fresno 9, Kingsburg 1, Imperial County 2, Inyo County 4, Bishop 8, Kern County 34, Bakersfield 3, Delano 3, Lake County 2, Los Angeles County 23, Alhambra 4, Burbank 4, Compton 6, Culver City 3, Glendale 8, Inglewood 2, Long Beach 32, Los Angeles 52, Montebello 1, Pasadena 2, Pomona 1, Santa Monica 2, Torrance 3, Lynwood 3, South Gate 2, Monterey Park 2, Madera County 13, Marin County 1, Sausalito 1, Mendocino County 5, Mono County 4, Monterey County 12, Carmel 3, Monterey 4, Salinas 14, Nevada County 1, Orange County 6, Newport Beach 2, Santa Ana 3, Laguna Beach 2, Riverside County 2, Riverside 21, Indio 1, Sacramento County 1, Sacramento 2, Ontario 1, San Diego County 2, National City 1, San Diego 12, San Francisco 54, San Joaquin County 3, Stockton 8, San Luis Obispo County 1, San Luis Obispo 5, Burlingame 1, Daly City 2, Redwood City 1, San Carlos 29, Santa Barbara County 2, Santa Barbara 5, Santa Clara County 6, Palo Alto 6, San Jose 3, Santa Clara 2, Santa Cruz County 1, Santa Cruz 7, Watsonville 1, Shasta County 3, Yreka 4, Solano County 1, Sonoma County 1, Petaluma 7, Red Bluff 2, Tulare County 3, Ventura County 7, Ventura 4, Ojai 5, Marysville 2.

Diphtheria

27 cases: Oakland 3, San Leandro 1, Contra Costa County 1, Imperial County 1, Imperial 1, Los Angeles County 1, Los Angeles 3, Madera County 2, Monterey County 1, Orange County 2, Riverside 2, Sacramento 1, San Diego County 3, San Diego 1, San Francisco 3, Petaluma 1.

German Measles

26 cases: Alameda County 2, Alameda 1, Berkeley 2, Contra Costa County 1, Long Beach 2, Los Angeles 10, Santa Ana 1, San Diego 1, Siskiyou County 1, Yreka 2, Sonoma County 1, Tulare 2.

Influenza

501 cases: Berkeley 1, Oakland 1, Butte County 1, Gridley 2, Fresno County 19, Coalinga 3, Fresno 32, Orland 12, Kern County 15, Bakersfield 3, Hanford 7, Lemoore 6, Los Angeles County 55, Alhambra 1, Burbank 1, El Monte 1, Glendale 3, Glendora 2, Inglewood 1, Long Beach 5, Los Angeles 157, Pasadena 2, San Gabriel 1, Santa Monica 1, Whittier 6, Hawthorne 2, Maywood 1, Nevada County 1, Orange County 6, Anaheim 10, Fullerton 2, Huntington Beach 1, Orange 4, Santa Ana 10, La Habra 2, Placer County 1, Riverside County 14, Corona 2, Sacramento County 1, Sacramento 3, Ontario 1, San Francisco 4, San Luis Obispo County 6, San Jose 2, Solano County 1, Vallejo 2, Turlock 6, Sutter County 4, Corning 49, Ventura County 7, Oxnard 16, Santa Paula 1, Yuba County 3, Marysville 1.

Malaria

2 cases: Orland 1, Sacramento 1.

Measles

395 cases: Oakland 1, Calaveras County 1, Fresno County 2, Fresno 1, Imperial County 5, Kern County 27, Bakersfield 1, Delano 2, Los Angeles County 7, Alhambra 1, Glendale 2, Los Angeles 13, Pasadena 1, San Fernando 2, San Gabriel 1, Monterey Park 1, Madera County 1, Gustine 1, Merced 1, Monterey County 2, Orange County 1, Anaheim 1, Fullerton 1, Santa Ana 8, Plumas County 1, Corona 1, Riverside 2, Indio 1, Sacramento County 28, Redlands 1, San Diego County 32, Chula Vista 1, La Mesa 1, National City 31, San Diego 165, San Francisco 1, San Joaquin County 1, Stockton 4, Santa Barbara County 2, Siskiyou County 1, Yreka 9, Tulare County 18, Tulare 7, Ventura County 1, Ventura 2, California 1.*

Mumps

305 cases: Berkeley 11, Oakland 7, Butte County 2, Gridley 1, Williams 1, Fresno County 15, Fresno 5, Kern County 19, Hanford 4, Los Angeles County 9, Culver City 1, Glendale 2, Long Beach 9, Los Angeles 27, Montebello 1, Pomona 1, San Fernando 6, South Pasadena 1, Madera County 4, Monterey County 3, Napa County 3, Orange County 1, Anaheim 5, Brea 2, Newport Beach 1, Orange 1, San Clemente 1, Riverside 5, Sacramento 1, Redlands 1, San Diego 6, San Francisco 24, San Joaquin County 13, Stockton 14, San Luis Obispo County 4, Daly City 1, Redwood City 7, San Mateo 2, Belmont 1, Santa Barbara 2, Santa Maria 1, Santa Clara County 26, Mountain View 10, Palo Alto 23, Siskiyou County 5, Yreka 3, Tulare County 2, Porterville 1, Yuba County 3, Marysville 7.

Pneumonia (Lobar)

98 cases: Alameda 3, Berkeley 2, Oakland 8, Fresno County 1, Coalinga 3, Fresno 3, Inyo County 2, Los Angeles County 10, Glendora 1, La Verne 1, Long Beach 1, Los Angeles 27, Monrovia 1, Montebello 1, Pasadena 1, Pomona 1, Redondo 1, Torrance 1, South Gate 1, Maywood 1, Anaheim 1, Riverside 3, Sacramento 5, San Francisco 5, San Luis Obispo County 1, Paso Robles 1, San Mateo 3, Santa Clara County 1, Sonoma County 1, Sebastopol 1, Sutter County 2, Trinity County 1, Yuba County 3.

Scarlet Fever

222 cases: Berkeley 2, Oakland 6, Butte County 1, Gridley 1, Oroville 1, Calaveras County 1, Fresno County 3, Fresno 2, Eureka 1, Imperial County 1, Holtville 1, Imperial 1, Kern County 13, Bakersfield 1, Lake County 3, Los Angeles County 25, Glendale 1, Hermosa 1, Inglewood 7, Long Beach 5, Los Angeles 36, Monrovia 2, Pasadena 5, San Gabriel 1, Santa Monica 1, Hawthorne 1, South Gate 4, Madera County 1, Mendocino County 2, Merced County 1, Salinas 1, Calistoga 1, Orange County 5, Santa Ana 4, Plumas County 1, Riverside County 1, Corona 5, Riverside 3, Indio 2, Sacramento 2, Redlands 2, Oceanside 1, San Diego 2, San Francisco 19, Stockton 2, San Luis Obispo 3, Burlingame 1, Daly City 1, Redwood City 1, Santa Barbara 3, Santa Maria 1, Santa Clara County 4, Palo Alto 1, San Jose 1, Shasta County 1, Sonoma County 4, Sutter County 1, Visalia 2, Ventura County 5, Santa Paula 1, Ventura 9, Yuba County 1.

Smallpox

3 cases: Tulare County.

Typhoid Fever

2 cases: Amador County 1, Alturas 1.

Whooping Cough

183 cases: Alameda 4, Oakland 8, Fresno County 1, Imperial County 1, Kern County 4, Bakersfield 10, Los Angeles County 27, Compton 2, Glendale 1, Los Angeles 12, San Fernando 2, Santa Monica 3, Whittier 12, Sausalito 1, Mendocino County 1, Orange County 2, Santa Ana 2, Laguna Beach 2, Riverside 4, Indio 5, San Diego County 2, San Diego 6, San Francisco 18, Redwood City 4, Santa Barbara County 2, San Jose 21, Vallejo 2, Sonoma County 2, Petaluma 6, Sutter County 1, Tulare County 11, Tulare 4.

Anthrax

One case: Pasadena.

Dysentery (Amoebic)

One case: California.*

Dysentery (Bacillary)

13 cases: Berkeley 2, Fresno County 1, Los Angeles County 1, Redondo 1, San Francisco 2, Sonoma County 6.

Poliomyelitis

11 cases: Fresno County 2, Kern County 3, Inglewood 1, Sacramento County 2, San Luis Obispo 1, Red Bluff 1, Trinity County 1.

Tetanus

2 cases: Los Angeles.

Trachoma

4 cases: Fresno County 2, Corona 2.

Hookworm

5 cases: Imperial County 2, Tulare County 3.

Paratyphoid Fever

One case: Los Angeles County.

Trichinosis

2 cases: Alameda.

Typhus Fever

One case: Los Angeles.

Food Poisoning

7 cases: Los Angeles.

Undulant Fever

4 cases: Kern County 1, Los Angeles 1, Pasadena 1, Placer County 1.

Coccidioidal Granuloma

3 cases: Kern County.

Septic Sore Throat

4 cases: Kern County 1, Ontario 1, San Diego 1, Sonoma County 1.

Epilepsy

53 cases: Los Angeles County 2, Glendale 1, Los Angeles 17, Mendocino County 22, Napa County 3, San Francisco 4, Sonoma County 1, Ventura County 3.

Rabies (Animal)

One case: Los Angeles.

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* Cases charged to "California" represent patients ill before entering the state or those who contracted their illness traveling about the state throughout the incubation period of the disease. These cases are not chargeable to any one locality.

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